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DIVISION 15 UTILITY CONSTRUCTION

SECTION 1500 GENERAL UTILITY REQUIREMENTS

1500-1 DESCRIPTION

This section involves construction of various utilities typically encountered on projects. Among other things, it outlines the Contractor's responsibilities and the responsibilities that applicable regulatory agencies may have on the work. North Carolina Department of Environment and Natural Resources (NCDENR) issues a permit for all water and sewer line work. The Engineer and his staff should become familiar with the requirements of any applicable permit. All permits require that a Professional Engineer certify and seal the final as-built plans upon completion of the work.

The Utilities Section can help the Engineer obtain information on NCDENR Rules and Regulations. There are many different types of permits required for utility construction work. Several of these permits were incorporated within the highway project permits.

The utility work should either be located outside of environmentally sensitive and jurisdictional areas or should have appropriate permits. Conformance with these permits is essential. The Department is responsible for obtaining the state and federal permits for the contract utility construction work.

Water and Sanitary sewer permits are obtained from the NC Department of Environment and Natural Resources or from delegated local authorities. The local Regional Environmental Engineer provides oversight and permit enforcement.

These permits are obtained under the utility owner's name. Therefore, the utility construction work is being performed under their oversight. The Department acts as an agent for the utility.

Permits are required for construction of potable water lines from the NCDENR-DEH or from delegated local utilities. The rules for water lines can be found at <http://portal.ncdenr.org/web/guest/>.

Permits are required for construction of sanitary sewer lines from the NCDENR-DWQ or from delegated local utilities. The rules and minimum design criteria for sanitary sewer lines can be found at <http://portal.ncdenr.org/web/guest/>.

Minor relocations with the same size and in close proximity to the existing facilities are considered maintenance and do not require permits. The decision to classify utility work as maintenance is coordinated with the Utility Owner.

Permits are obtained under Professional Engineer certifications. There are many criteria to follow for designing and obtaining the permits. The capacity or flow on the lines is a primary concern and is permitted based upon the particular line and the whole utility system. Typically for relocating existing facilities, the capacity or flow on the new lines is permitted at no change in flow from the existing lines. Changes to the design that cause changed flows require re-permitting.

The water and sewer permits apply to the mains and the portions of the service lines owned by the Utility Owner. Ownership of water and sanitary sewer lines typically ends at the Right of Way line for service lines to property owners and is typically marked by either placement of a meter or a cleanout. The property owner owns the service and internal distribution utility lines. These lines are regulated under the Plumbing Code of the local jurisdiction. The Department does not normally obtain plumbing permits, because the work is

minor. However, if the work on private property becomes extensive, the Contractor should obtain permits.

A NC Professional Engineer must certify the construction of all permitted water and sewer lines. These certifications are required before placing the new lines into service.

Any questions or concerns about the design and permits should be directed to the licensed Engineer who signed the design plans and then to the Utilities and Encroachments Engineering Unit Utilities Section Engineer.

1500-2 COOPERATION WITH THE UTILITY OWNER

All utility owners should be invited to the preconstruction conference. This conference allows general discussion of all utility work. Also, submittal requirements can be discussed. The Contractor should be urged to provide submittals as soon as possible because the Specifications allow 40 days for the review. When utility work is extensive, a specific utility construction conference should be held before the utility work begins to address concerns of the Contractor or owners.

As a part of the preconstruction conference the Engineer should discuss the utility construction plans and items with the utility owner(s) to ensure that the owners' requirements are included in the plans and specifications. **If these requirements are not included in the plans and specifications, the Utilities Section should be notified immediately to prevent project delays.**

It is suggested that the Engineer develop a list of contacts for all utilities. Include the contact for the Contractor, Subcontractors, Utility owner, and the Engineer's staff as applicable. This list can then be distributed to all interested parties.

Invite utility owners to monthly construction conferences when utility construction and schedules will be discussed. Owners can be helpful in planning work because of their knowledge of their system. Also, this allows them to be kept abreast of the work and they can schedule inspections or reviews of the work as necessary.

1500-3 UTILITY LOCATIONS AND CONTRACTOR'S RESPONSIBILITY

This section provides guidance to the Contractor regarding his responsibilities for determining utility locations. There is a utility locating service available. Also, some projects are developed utilizing the services of a Subsurface Utility Engineering (SUE) firm. The Engineer can obtain any information developed by the SUE firm from the local Location and Surveys office. The Engineer can look at the Conventional Symbols page of the Plans to see if SUE information was utilized on the project. There are 3 levels of SUE Data that are used within the Department. Level A is where horizontal and vertical information is available for the underground utility. Level B is where horizontal information is available for the underground utility. Level D is just a map of the underground utility and is the least reliable.

Plan locations for existing utilities are based on the best available information and may not be precisely accurate. It is incumbent upon the Contractor to determine the exact location of utilities before beginning work in a location. If the Contractor performs exploratory excavation in order to locate existing underground utilities, payment will be made in accordance with Article 104-7 of the Standard Specifications.

1500-4 WEEKEND, NIGHT, AND HOLIDAY WORK

Customers affected by any interruptions in service should be notified well in advance of the interruption. If business customers' hours of work vary, it will be difficult to shut-off service without impacts. Service interruption should be coordinated through the utility owner. Some owners may want to assume all responsibility for notifying customers of service interruptions; otherwise, the Contractor should notify those affected by the service interruption. These are activities that need to be coordinated with owners. The owner's requirements need to be followed as closely as possible.

1500-5 RELATION OF WATER MAINS TO SANITARY SEWERS

These relationships are required to minimize or eliminate the possibility of potable water being contaminated. Strictly follow the requirements of this section. The Engineer should consult the Utilities Section Engineer if there is a problem meeting these requirements.

1500-6 PROTECTION OF PEDESTRIAN AND VEHICULAR TRAFFIC

When the Contractor is allowed to detour traffic, the Engineer, Contractor, and the utility owner should plan all work to limit the time of needed detours.

When it is necessary for the Contractor to construct bridges over excavations for the purpose of accommodating pedestrian or vehicular traffic, the requirements of Section 400 of the Specifications will apply regarding the design, construction, maintenance, and removal of any necessary bridges.

Excavation near vehicle or pedestrian traffic should not remain open overnight.

Roadway cuts should be patched with pavement material the same day that the cut is made if traffic will be using the roadway. Do not allow traffic to run on unpatched cuts due to safety and liability considerations.

1500-7 SUBMITTALS AND RECORDS

The contractor shall provide "As-Built" plans of all installed utilities.

SECTION 1505
EXCAVATION, TRENCHING, PIPE LAYING, & BACKFILLING FOR UTILITIES

1505-3 CONSTRUCTION REQUIREMENTS

For pipes that have a bell, the Contractor shall excavate for the bell so that the entire length of the pipe will rest on the trench floor.

When the Contractor uses well points, care shall be exercised so that no damage results from the discharge. It may be necessary to use stilling basins or rip rap to dissipate the energy of the discharge.

Any shoring required shall be in accordance with OSHA requirements. If shoring is required for the maintenance of traffic, the Project Special Provision should be included in the contract.

Fabric slings or other methods may have to be used to prevent damage to pipes or coatings.

1505-4 REPAIR OF PAVEMENTS, SIDEWALKS, AND DRIVEWAYS

Any operation affecting areas of public use should be planned and conducted so that the pavement and/or driveways can be repaired the same day. It may be necessary to use high-early strength concrete to open drives as soon as possible. It may be possible to construct one-half of a driveway at a time to ensure access for the property owner(s).

1505-5 CONCRETE ENCASEMENT OF UTILITY LINES

Concrete encasements are primarily used for protecting utility lines when adequate cover can not be achieved.

1505-6 MEASUREMENT AND PAYMENT

The following work and items will also be considered as incidental to the contract price for the applicable utility item and no separate measurement or payment will be made:

1. Undercut or Wet Excavation
2. Dewatering of Excavation
3. Shoring or Sheet piling (except temporary shoring for the maintenance of traffic)
4. Thrust restraint
5. Bedding Material
6. Select Material for Backfill

SECTION 1510 WATER LINES

1510-2 MATERIALS

At the preconstruction conference, the Contractor should be encouraged to submit any necessary catalog cuts as soon as possible to prevent a potential delay to his work.

It should be noted that the contract requires 8 copies of the submittals. It should also be emphasized that 40 days are necessary for the Department to conduct the submittal review process. If the submittals are in order, the review should not take this long. The Utilities Section Engineer may be able to grant verbal approval after the review with a follow-up letter. If the submittals are not in order, then the Utilities Section Engineer will contact the Engineer and point out the discrepancies. It will help expedite the process if the Engineer reviews the catalog cuts for general compliance with the requirements of this section before submitting them for approval.

1510-3 CONSTRUCTION REQUIREMENTS

When guardrail is to be installed on the project, the location of the guardrail and utility should be carefully coordinated to avoid conflicts.

During water line shutoffs, it may be necessary to maintain water for a business sprinkler system by using a city water/fire truck. This needs to be coordinated between businesses and utility owner.

Sometimes the operation of water systems will dislodge debris that clogs faucet strainers, or if the lines are not kept clean during construction, the problem will occur or be aggravated. When the problem is a result of the Contractor's negligence, it will be the Contractor's responsibility to correct the problem.

The Engineer shall require the Contractor to repair any damage or remove any contamination. Plastic pipe will be protected from direct sunlight. Black plastic covering or other material that blocks the sunlight will be used.

PVC pipe will be marked with a detectable magnetic tape before backfilling the pipe for the purpose of future locating.

Use only materials to lubricate gaskets that have been recommended by the pipe and gasket manufacturers.

The Engineer should confirm anchoring requirements with the owner. Any differences should be resolved by consulting with the owners and the Utilities Section Engineer.

The Engineer should ask the owner to review the work periodically to ensure timely resolution of any questions the owner may have regarding the method of construction or materials used.

When interruption of services is necessary, the owners shall receive adequate advance notification. It is the Contractor's responsibility to perform this notification either by notifying the property owners individually or through working with the utility owner. Notification requirements should be established at the preconstruction conference or at the utility conference held before utility work begins. When several businesses are served by a line that is to be shut off, coordination to minimize impact is necessary. The final decision may rest with the utility owner.

Businesses involved with waste processing, food processing, and/or chemical processing may have a back flow preventer. These are owned by the business, not the utility. The right of

way agreement may require the owner to relocate these devices. Also, if they have to be placed on the business owner's property, an easement to do the work may be necessary.

If the work is not kept free of debris, the system can become clogged and create problems for the Contractor as well as the system customers.

(A) TESTING AND STERILIZATION

NCDENR requires that a Professional Engineer certify the construction. The permit is obtained for the Department by the Project Services Unit. The Engineer should have a copy of this permit and become familiar with any specific requirements.

Pressure and leak test requirements and acceptable results should be discussed with the owner. Any requirement by the owner that is different from those in the contract should be resolved before sterilization and testing begins.

If the Contractor uses clean water containing the required 100 PPM chlorine to conduct pressure and leak testing, it will not be necessary to empty the line and put in more clean water containing 100 PPM chlorine to conduct the required sterilization. This reduces the amount of water that has to be disposed of by the Contractor.

Local ordinances should be followed when disposing of water used to test and sterilize water lines.

Furnishing all fittings, valves, extra pipe, water, and incidentals necessary to perform pressure, chlorinating, and leakage tests are incidental to the cost of the proposed water pipe.

Leak Test Calculations - English

Given: Pressure = 150 psi, Length = 4275 feet, Diameter = 10 inches

Where: W = allowable leakage in gallons/hr

$$W = \frac{4275 \times 10 \times \sqrt{150}}{133,200} = 3.931 \text{ gal/hour}$$

SECTION 1515 UTILITY CONTROLS

1515-3 CONSTRUCTION METHODS

(D) FIRE HYDRANTS

When it is necessary to remove or temporarily take hydrants out of service, the local fire department should be notified. If a fire hydrant is removed from service but left in place, it should be bagged to indicate that it is not operational.

(G) MISCELLANEOUS CONTROLS

It is recommended that corporation stops be placed approximately 1/3 of the way down from the top of the pipe. This may limit damage to corporation stops during future digging around the water line.

1515-4 MEASUREMENT AND PAYMENT

During the constructability phase of the preconstruction conference payment for adjusting water line items should be discussed so the Contractor will be aware of when he will be compensated for multiple adjustments. In phased construction, an existing water meter or fire hydrant might have to be adjusted numerous times for **safety** reasons to keep them in service. The Contractor would be due payment for each of these adjustments. If the Contractor elects to make numerous adjustments on an existing water meter or fire hydrant for his convenience the Contractor is only due one payment for these multiple adjustments as the contract unit price for the relocation requires the utility to be installed at finish grade. When the item is a new water meter or fire hydrant, it is the Contractor's responsibility to install these items at finish grade, and he is only due one payment for each of these items.

SECTION 1520

SANITARY SEWER INSTALLATION

1520-2 MATERIALS

At the preconstruction conference, the Contractor should be encouraged to submit any necessary catalog cuts as soon as possible to prevent a potential delay to his work.

It should be noted that the contract requires 8 copies of the submittals. It should also be emphasized that 40 days are necessary for the Department to conduct the submittal review process. If the submittals are in order, the review should not take this long. The Utilities Section Engineer may be able to grant verbal approval after the review with a follow-up letter. If the submittals are not in order, then the Utilities Section Engineer will contact the Engineer and point out the discrepancies. The Engineer should review the catalog cuts for general compliance with the requirements of this section before submitting them for approval.

Vitrified clay pipe may develop cracks during shipping and handling. If this occurs, the pipe should be rejected.

1520-3 CONSTRUCTION REQUIREMENTS

PIPE INSTALLATION

The Contractor may have to use a template to guide final shaping of the pipe bed to get proper support on the lower fourth of the pipe.

Force main installation shall be in accordance with this article. In addition, force mains require anchorage. The plans should be followed for constructing proper anchors for the force main.

(A) GRAVITY SANITARY SEWER

(1) Visual Inspection

When the utility owner desires to make a video of the sewer construction work, it should be coordinated with the Contractor to minimize any impact.

The Engineer should discuss testing procedures with the owners of the sewer facilities to resolve any differences before the tests are performed.

(2) Force Main Sanitary Sewers

Before force mains are tested, all anchors should be in place and the line properly backfilled.

Example of Leak Test Calculations for Sewer Force Mains - English

Given: $L = 1625$ feet $D = 8$ inches

Where: W = Allowable leakage in gallons/hour

$$W = 0.000106 \times 1625 \times 8 = 1.378 \text{ gallons/hour}$$

SECTION 1525 UTILITY MANHOLES

1525-2 MATERIALS

This section lists materials generally used in manhole installation. If the Engineer is presented with alternate products not covered by our specifications, the use of these products should be investigated by consulting with the Utilities Section and the Materials & Tests Unit.

If the Contractor proposes an item of material that is not included in the standard drawings, then catalog cuts and/or drawings will have to be submitted to the Utilities Section Engineer for approval.

1525-3 CONSTRUCTION REQUIREMENTS

Municipalities have differing requirements regarding eccentric or concentric cones for manholes. An understanding should be reached with the owner before ordering and/or constructing the manhole.

It is important for the manhole to have the proper foundation. If the foundation is of poor supporting value, the manhole may settle. Settling could result in the pipes being sheared off, or it may change the pipe alignment causing a break in the joint seals. If the foundation is rock and a conditioning material is not placed between the rock and foundation of the manhole, point bearings may occur. This could result in failure of the manhole base or a shift in manhole alignment.

When practical, cast-in-place concrete and masonry construction should not be used at locations where pedestrian or vehicular traffic must be maintained to avoid delays in backfilling the manholes.

(A) CAST-IN-PLACE CONCRETE, BRICK, AND BLOCK MASONRY

When it is necessary to construct manholes of varied dimensions, the basis of payment must be established before the work is performed.

1525-4 MEASUREMENT AND PAYMENT

Since the bottom of a sanitary manhole is not flat, measure from the bottom of the invert channel constructed in the manhole. If the Contractor's construction sequences permit, the measurement should be made before the invert channel is constructed.

SECTION 1530
ABANDON OR REMOVE UTILITIES

1530-3 CONSTRUCTION REQUIREMENTS

(B) ABANDONING MANHOLES

It is necessary to break the manhole down below the spring line so that proper compaction can be obtained. The spring line is the center of the lowest pipe that is entering the manhole. It may be necessary to remove the manhole more than 2 feet below subgrade to get below the spring line. It is necessary to plug all pipes entering the abandoned manhole to prevent water flow that will erode material and create a void under the road.

SECTION 1540
ENCASEMENT

1540-3 CONSTRUCTION REQUIREMENTS

A conference needs to be held with the Engineer's staff, Prime Contractor, and the Subcontractor who will install the encasement, prior to beginning any work to discuss the method of installation, boring pit and materials.

If shoring is required for the maintenance of traffic in the boring pit the Project Special Provision should be included in the contract.

(E) CARRIER PIPE INSTALLATION

Spacers or insulators that are used to support the carrier pipe must be approved by the Engineer prior to installation.

SECTION 1550
TRENCHLESS INSTALLATION OF UTILITIES

1550-1 DECSRIPTION

It is important that the Prime Contractor submit for review by the Department's Engineer the method of installation designed by an engineer licensed by the State of North Carolina.

1550-5 QUALITY CONTROL

(B) LINE AND GRADE

It is important to check the horizontal and vertical alignment of the encasement pipe to ensure it is installed at the required alignment and grade.

TECHNICIAN'S CHECKLIST
SECTION 1500
UTILITY INSTALLATION

- 1) Study the Specifications, plans, Special Provisions and Permits.
- 2) Verify that materials supplied are the same as those shown on the catalog cuts.
- 3) Ensure pipe staking is correct.
- 4) Observe pipe sections after delivery to the site. Record any joint or section rejected and the reason for the rejection. If unloading or handling is careless, notify the Contractor's supervisory personnel.
- 5) Observe and check the Contractor's methods of foundation excavation and control of pipe grade, including pipe camber.
- 6) If unsuitable material or rock is encountered, determine the method of conditioning to be used.
- 7) Follow the provisions of subarticle 300-9 of the Specifications if undercut is encountered.
- 8) Do not allow the use of any conditioning material until the method of material measurement and payment has been established and the material has been approved for use.
- 9) Temporary water diversion is the responsibility of the Contractor. Ensure that it is adequate to prevent foundation damage.
- 10) Check the construction of the shaped bedding.
- 11) Insure that pipe is laid, joints made, and protected in accordance with Specification requirements.
- 12) Check clearance between water lines and sewer lines. Make sure the proper clearances are maintained or ductile iron pipe is used in accordance with the Specifications. This is due to concerns over contamination of drinking water.
- 13) Backfill is to be placed in 6-inch or less layers, unless otherwise authorized, with both sides brought up at the same time to levels that will prevent unbalanced loading on the sides.
- 14) Perform density tests to verify that compaction is satisfactory.
- 15) Backfill is to be shaped to drain when work is suspended or completed.
- 16) If select backfill material is required, be sure that this has been tested and approved prior to use.
- 17) Make pavement repairs in accordance with details in the plans or the standard drawings.
- 18) Pressure test, leak test, and sterilize water lines in accordance with the Specifications.
- 19) Leak test gravity sewer mains. In lieu of leak tests, 24-inch diameter or smaller sewer mains may be pressure tested. Pressure test and leak test force mains.
- 20) Ensure manholes are constructed in accordance with the plans and Specifications.
- 21) Ensure manhole inverts and drop assemblies are constructed in accordance with the Standards.
- 22) Conduct a preconstruction conference prior to performing trenchless construction to discuss the Contractor's method of installation that was designed by an Engineer licensed by the State of North Carolina.
- 23) Monitor ground movement during trenchless construction for measuring settlement.
- 24) It is the Contractor's responsibility to obtain and request the Engineer's observation for installations "not in soil".